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the World
**One
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at a Time

Conquering the World **One**



Tedd Weitzman

Southern Company is a large power utility focused on generating and selling electricity in the southeastern United States. In 2012, Southern Company provided over 40,000 megawatts of power generation to 4.4 million customers and had operational revenue of \$16.54 billion.

Asset at a Time



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With asset holdings of approximately \$45 billion, Southern Company, one of the South's best-kept secrets and a stock broker favorite, ranks 84th internationally in infrastructure assets on the Bentley *Infrastructure 500*. The utility ranks just slightly ahead of New York City.

The company is known for big bets and it is tackling two of the industry's biggest – nuclear power and clean coal. As the world watches,

Southern Company is among the first in the U.S. to build new nuclear units in more than 30 years—Vogtle Units 3 and 4 near Waynesboro, Georgia. The reactors represent a capital investment of more than \$14 billion dollars.

At the same time, Southern Company is building another world stage project in Kemper County, Mississippi—an integrated gasification combined cycle unit using Transport Integrated Gasification™ (TRIG) tech-

nology power. The units at the Kemper County energy facility are scheduled for commission in 2014 and are sponsored by Southern Company, KBR, and the U.S. Department of Energy (DOE).

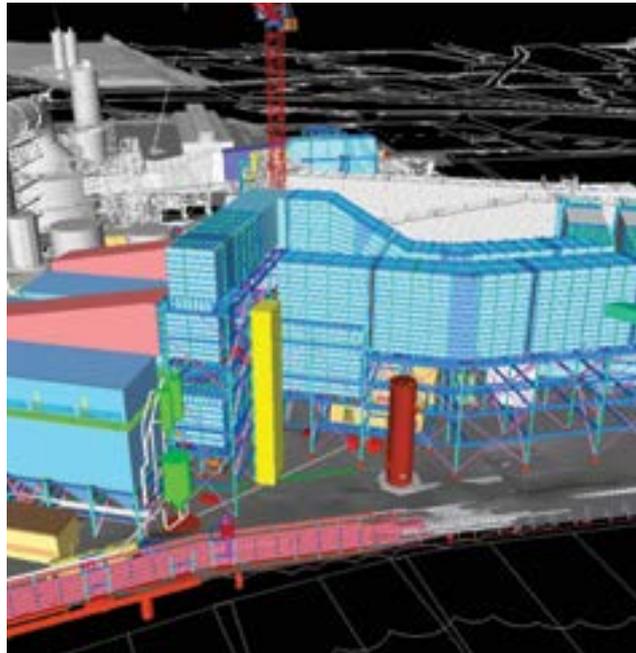
While investing in these megaprojects, Southern Company spent \$8.3 billion deploying environmental projects throughout 2012, mostly at existing coal-fired facilities. The company plans to invest at least another \$3.6 billion through 2015 on further environmental projects, including baghouses, precipitator upgrades, active carbon injections, sulfuric acid mist clouds, and other technologies that reduce mercury emissions and flue gas particulate so common at coal plants.

Southern Company is an engine with many parts and acts as an umbrella for its operating companies—Alabama Power, Georgia Power, Gulf Power, Mississippi Power, Southern Nuclear and Southern Power—which run and maintain the facilities. Southern Company also boasts an operations engineering and construction services group (E&CS) that acts as an engineer, procure, and construct (EPC) contractor for capital expenditure (CAPEX) projects. E&CS is an extension of the facilities and executes annual budgeted operational expenditures (OPEX) projects, referred to internally as retrofit projects. By maintaining and supporting E&CS, Southern Company is uniquely positioned in the U.S. power industry to deploy a comprehensive asset lifecycle information management (ALIM) program, including engineering information management (EIM) and seamless handover of asset documents and data to facilities for operations and maintenance – a goal much easier to state than to execute.

ALIM and EIM are complicated subsets of an already complicated subject, asset management. ISO55000 is a new international standard for asset management. The challenges and best practices of collecting and maintaining engineering information, and saving time and money through a project execution process are well known in the industry.

Project execution processes live or die by asset data and document management strategies. Without these, data and document handover to a facility is nearly impossible. The goal is to provide a peek under the EPC hood, giving system owners and operators a language and set of concepts to better engage engineering and construction partners about asset information management. The responsibility is shared – a seamless handover rests not only on the EPC, but also the owner. Without a clear understanding of how data is managed throughout the project execution process, how can an owner expect a clean handover of asset information? Owners often know what they want regarding data and documents as a project winds down, but often do not have requirements explicitly defined in contracts. They often lack the understanding needed to tackle the challenges associated with generating and maintaining the data and documents.

Many of the ALIM issues encountered during project execution are the same asset data maintenance issues facilities encounter during operations. Keeping data complete and up-to-date is hard, and here distinctions must be drawn; data is not information, information is not knowledge. In-



Future investments for environmental projects - Baghouses

SOUTHERN COMPANY IS UNIQUELY POSITIONED TO DEPLOY A COMPREHENSIVE ASSET LIFECYCLE INFORMATION MANAGEMENT (ALIM) PROGRAM AND SEAMLESS HANDOVER OF ASSET DOCUMENTS AND DATA TO FACILITIES FOR OPERATIONS AND MAINTENANCE

formation is derived from data and when this information is valuable, it can be considered knowledge. Information, generally speaking, is processed data put into context.

Even a small system generates a tremendous amount of asset data. One pivotal and seemingly easy bit of data to collect about an asset is drawing references. It is seemingly easy because the statement, “provide document references for assets on this project,” is easy to say and the final requirement easy to visualize. There are many assumptions made in this statement:

- Documents and document data are managed.
- Asset data is managed.
- Asset relationships to documents are managed.
- A format for both documents and assets is agreed upon (a document reference to an unrecognized asset tag is useless, as is an asset tag reference to an unrecognized tag).

Further assumptions can be added to the list. The execution of any list item is far from trivial, but the return on investment (ROI) for maintaining the alignment of document to asset data is tremendous. Southern Company justified purchasing an ALIM program based on the expected ROI estimated by associating quality records and documents to functional asset locations and tags. This very conservative ROI is calculated at \$4 million per 200 Southern Company employees engaged with assets and documents. For the life of the facility, this equates to hundreds of millions of dollars saved by reducing the amount of time spent searching for asset-related documents. Another

big assumption is embedded in this last statement: the asset-to-document relationships are maintained throughout the facilities and asset lifecycles.

Southern Company has a robust process for managing documents of record, including a program to keep drawing content up-to-date with current field conditions. Drawing approval and distribution is strictly controlled.

Unfortunately, purely managing documents of record did not include maintaining asset references to the drawings. The company formally rec-

ognized the benefit of creating and maintaining these references in 2006 and developed a program to fill the information gap that provided the ability to search against functional tag locations. Success for this kind of functionality is dependent on the relationship of three things: technology, people and process.

Though in practice these three constituents must work in tandem, the processes in the development phase are the key to success. Technology must support processes documented in clear procedures and standards that are executable by actual people.

In early 2007, Southern Company started developing an ALIM system: Bentley Systems Incorporated's eB Data Quality Manager. By the end of 2007, it was clear that the system was not executing tasks as desired. Southern Company's first major success in the deployment of the ALIM system was recognizing that this failure was not attributable to the deployed technology. The failure was in the processes, procedures and standards, creating a culture that rendered the company's ALIM goals difficult to execute. For example, asset tags were not managed to standard because the standard did not reflect best practice. Also, procedures did not require asset data reviews in the iterative design process. In other words, data quality was not an integral part of the design process.

Southern Company recognized that design data must be reviewed with the same rigor as documents. This requirement is often viewed as a burden by design teams culturally oriented to producing drawings. In order to solve this problem, the company had to develop a data-centric culture that technology could support. In 2007, eB Data Quality Manager as a technology was shelved to address outstanding process and people issues.

A two-year period, referred to internally as the "circle of strife," ensued. The moniker accurately represents the challenges—a wholesale change of culture. In that two-year period, the seed for a data-centric environment was planted and nurtured. By 2009, enough progress was made to pull the technology back off the shelf. Several business unit subject matter experts (SMEs) were involved with the project since 2006. The team coordinated with IT and the software vendor on the initial configu-

ration of the eB Data Quality Manager and participated in the many circle of strife meetings that hammered out the procedures and standards to support the new data-centric environment. The electrical design SME was asked to lead the technology development component in 2009.

An estimated 50 percent of the employee's time was required over a two-year period to lead the configuration and final deployment. At the end of that period, the SME would walk away from a fully functional and deployed system and go back to electrical design duties 100 percent. If Southern Company's first major success was recognizing that the early failure in deployment was not seated in the technology, its second major success was recognizing, partly through the SME's encouragement, that deploying this technology was neither a part-time job nor a project with an end. The initiative required full-time resources to support both the technology and the processes it enabled. Fortunately, the ROI justified the dedication of full-time, permanent resources to the effort.

Nearly five years after the initial project initiation, eB Data Quality Manager went into production in April 2011. eB Data Quality Manager went online specifically to support the 21st century clean coal Kemper County energy facility.

The facility will produce less nitrous oxide, sulfur dioxide and mercury emissions than traditional pulverized coal plants. Additionally, the facility plans to capture at least 65 percent of the carbon produced. The captured carbon will be used in enhanced oil recovery and is expected to yield an additional two million barrels of domestically sourced oil every year. As of July 2013, over 300,000 asset records are managed in

eB Data Quality Manager for the plant. It is important to note that this count includes over 30,000 documents that are considered assets. Assets also include more than 100,000 functional locations, approximately 40,000 process lines and segments, and more than 100,000 physical assets extracted from the model, mostly individual pipe spool pieces. The data set available for the facility through the project execution phase is deriving more than \$4 million ROI related to startup and commissioning activities alone when compared to costs on previous projects. The ROI may seem small. However, when compared against the budget specifically for startup and commissioning processes, which includes very little physical asset cost, the savings are significant, realized through processes incorporating the availability of quality data and automations that data enables.

Since fall of 2012, asset information for environmental projects at six existing facilities is managed in the system, bringing total asset counts to more

than 700,000. Two more facilities are anticipated to go online by year end 2013. An estimated 15 facilities will be live by the end of 2014. The end goal is to have the entire coal and gas fleet modeled in the system and all the data available to the facilities. The system provides transparency of the asset's engineering information, including drawing references, through all phases of an asset's lifecycle.

MANY OF THE COMPREHENSIVE ASSET LIFECYCLE INFORMATION MANAGEMENT ISSUES ENCOUNTERED DURING PROJECT EXECUTION ARE THE SAME ASSET DATA MAINTENANCE ISSUES FACILITIES ENCOUNTER DURING OPERATIONS



Construction of the Southern Company

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task than managing documents, so learn how to manage and maintain documents first. Many of the principles of managing quality documents are applicable to managing data, including review and approval processes.

Another key component to managing data is ensuring it is represented accurately across multiple systems. Realizing the concept of "one source of truth" as it relates to asset information is not possible. One example is the need for operations and maintenance personnel to maintain and access information through a computerized maintenance management system (CMMS). This system reflects much of the engineering information created upstream in design tools. But the CMMS is not a place to manage engineering data or to make design changes.

An important aspect of the ALIM system is the ability to manage asset location changes, keeping information intact as it relates to current conditions, but also reflecting planned changes for publication when executed or as built. If an organization does not have a process in place to manage as-built drawings, managing as-built data poses an almost insurmountable problem. In other words, managing data is a more difficult

Devising ways to keep the design engineering information synchronized with the CMMS is a non-negotiable requirement. Develop processes to ensure consistency. Anyone attempting this task will run into immediate, high-level issues keeping the data aligned. The first challenge is ensuring tagging in both systems is aligned. The tagging that follows an asset through design execution is rarely the tagging used in the CMMS. CMMS

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tagging is typically more intricate and complex, relating directly to facilities accounting or account classification. Overcoming just this one tagging discrepancy can pose an almost insurmountable problem to the information flow from system to system. Even at Southern Company, manual processes are required to bridge the gap. What seemed at one time a gorge the size of the Grand Canyon is now a river with a boat to ferry data to operations or a bridge is in place.

ANOTHER KEY COMPONENT TO MANAGING DATA IS ENSURING IT IS REPRESENTED ACCURATELY ACROSS MULTIPLE SYSTEMS

Attention to detail is important. At first glance it seems like a mirror image, but upon closer examination, there are subtle but distinct differences between the CAPEX and OPEX support structures. It happens to any facility in operation and often earlier during design execution. No matter how many conditions are accounted for, actual construction of the design leads to inevitable discrepancy. In many instances, designers and engineers do not select specific equipment to reside at a location. They only define the criteria. The equipment operation at the facility meets real-world conditions. That is where discrepancy between design information and a CMMS creeps in over time. Processes must take into account as many variables as possible to mitigate system data misalignment.

For better or worse, the technology available at our fingertips has produced an expectation to produce the right information at any given moment instantaneously. For the most part, the technology is capable of executing this expectation. The greater effort is ensuring processes are in place that the technology can actually support. Southern Company is still on its journey, discovering variables that affect ALIM processes in making asset information available. Some variables are easier to accommodate than others, but none can be dismissed. A phased and linear approach was adopted with both short- and long-term goals, including quantifiable ROI. The approach is flexible, frequent changes to process and standards are anticipated, and dedicated resources are recognized as a key to success. Southern Company has proven that committing resources to an ALIM strategy produces quantifiable results and that the ends do justify the means.

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Tedd Weitzman has worked for Southern Company's Engineering and Construction Services for 12 years. He has focused on project execution processes, configuration management and automations to ensure efficient availability of information for CAPEX projects and O&M. Since 2009, Tedd has spearheaded the configuration and implementation of Southern Company's Asset Management Database. This project won Bentley Software's 2011 and 2012 Be Inspired Awards for Innovation in Asset Lifecycle Information Management.

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